1 Show steps in deciding the convergence behavior of the following:

(a) \[ \sum_{n=1}^{\infty} \frac{n^2}{2^n} \]  

(b) \[ \sum_{n=1}^{\infty} n \left( \frac{3}{5} \right)^n \]  

(c) \[ \sum_{k=0}^{\infty} \frac{k!}{10^k} \]  

(d) \[ \sum_{k=0}^{\infty} \frac{2^k}{k!} \]  

(e) \[ \sum_{n=1}^{\infty} \frac{1}{2n} \]  

(f) \[ \sum_{n=1}^{\infty} \frac{n^5}{1.01^n} \]  

(g) \[ \sum_{n=0}^{\infty} \frac{2^{2n}}{2n!} \]  

(h) \[ \sum_{k=1}^{\infty} \frac{k^k}{k!} \]  

(i) \[ \sum_{k=2}^{\infty} \frac{1}{\ln(k)^k} \]  

2 Announce an \( N \)-recipe for the limit of

\[ a_n = \frac{3n^2 + (-1)^n n}{4n^2 - 3n}, \]

then write a formal proof that your \( N \)-recipe works. Do not show your “dry labbing” this time. In your formal proof, be sure your “rising chain” is clear. Also, be explicit about any absolute-value removals. Some helps for this:

(i) something is positive from some point on

(ii) the triangle inequality

(iii) the absolute value of a product.